

### **RESPONSE AND REQUEST FOR RECONSIDERATION**

In response to the Office Action of March 30, 2010, Applicants hereby request the Examiner to reconsider the claims in view of the present amendments and remarks.

#### Claim Amendments

Claims 1, 6, and 11 have been amended to specify:

"wherein the dispersion viscosity as measured by TA Instruments AR 500™ Rheometer using "cone on plate geometry" measured at about 40°C at 100 s<sup>-1</sup> ranges from about 0.003 Pa s to about 5 Pa s."

Support for this amendment is provided by the specification on page 6, lines 21-25.

Claims 1, 6, and 11 have been amended to specify: "a solids content of greater than about 35 wt % when said metal base is other than a metal hydroxide". Support for this amendment is provided on page 5, line 23 of Applicant's specification.

Dependent claim 16 is new. Support for claim 16 is provided by the specification on page 6, lines 21-25.

Claim 17 is new. Claim 17 is a reformulated version of previously presented claim 10. Claim 17 relates to a grease composition comprising the dispersion of claim 1. In order to further specify that claim 17 relates to a grease, the carboxylic acid has been defined in such a way to indicate that it is a hydroxy substituted alkanolic acid. Support for claim 17 is provided by claim 10 as filed and the disclosure on page 4, line 31 to page 5, line 12 of Applicant's specification. In view of the addition of claim 17, claim 10 has been cancelled without prejudice.

Claim 17 also specifies "a carboxylic acid, wherein the carboxylic acid is a hydroxy substituted alkanolic acid". Support for this amendment is provided by the specification on page 14, lines 1-2.

Claims 1, 6, 11, and 17 specify a surfactant with a hydrophilic lipophilic balance (HLB) of about 2 to about 16. Support for this amendment is provided on page 8, lines 16 to 18 of Applicant's specification.

Claim 18 is new. Support for this claim is provided in the specification on page 6, lines 7-10.

Claim 19 is new. Support for claim 19 is provided in the specification on page 6, lines 13-14. The claim specifies wherein the composition is substantially free of an oil insoluble solvent.

Claims 20-22 are new.

Claim 20 relates to a process of claim 6 that requires step (4). Step (4) is a step that results in the formation of grease. Support for step (4) being mandatory is provided in the specification by the text on page 17, line 27 to page 18, line 3. In addition, examples Grease Example 1 to Grease Example 3 (see page 25, lines 17 to 31) exemplify making a grease by requiring the addition of a carboxylic acid (e.g., 12-hydroxystearic acid) to a dispersion prepared by steps (1) to (3) as presently defined in claim 6.

Claim 21 relates to a grease composition made by the process of claim 20. Support for this claim is provided by the disclosure on page 18, lines 7 to 10 and lines 12 to 26.

Claim 22 relates to the composition of claim 20 being used as a grease. Support for this claim is provided by the disclosure on page 18, lines 12 to 26.

#### Novelty and Obviousness Rejections

The Examiner has not raised a 35 U.S.C. §102(b) rejection to claims 1-15. Accordingly, it is submitted that all claims are considered novel.

New independent claim 17 is novel over the references cited by the Examiner for the same reasons claim 10 was considered novel.

The Examiner has raised a 35 U.S.C. §103(a) rejections to claims 1 to 15 over Forsberg (US 4,094,801) in view of Rothon (US 5,461,101) and in view of Crawford (EP0288296), and in view of Young (GB1 061 161) and further in view of Magyar (US 5,851,961). The Applicant respectfully traverses.

The Examiner is of the position that Forsberg discloses additives for lubricants and fuels that consist of magnesium-containing liquid dispersion composition. The Examiner noted that Forsberg does not teach either:

- (a) a mean particle size ranging from 15 nanometres to about 1 micrometre; nor
- (b) the organic medium containing less than about 2 wt % of water; nor
- (c) the dispersion having a solid content from about 15 wt % to about 84 wt %; nor
- (d) grinding the slurry.

The Examiner indicated that Crawford, Rothon and Young appear to disclose said technical features. The Applicant respectfully traverses that the references cited and combined by the Examiner result in the presently claimed invention.

Forsberg discloses compositions that contain water (typically significant amounts ranging from 2.73 wt. % 39.37 wt. %), and compositions that have 8 wt. % to 37.63 wt. % solids. In addition, the majority of compositions are noted to in the form of a gel (see column 9, line 40 to column 12, line 62; in particular examples 1-9 and 11). A gel as noted from "Concise Science Dictionary", Third Edition (a copy of the relevant page is enclosed, page 155) is a lyophilic colloid that has a coagulated to a rigid or jelly-like solid. In a gel, the disperse medium has formed a loosely-held network of linked molecules through the dispersion medium. In addition, examples 14 and 16 are noted by Forsberg as being solid or a grease-like material. As a result of the gelled nature or solid nature of the products of Forsberg, the viscosity of the products will be greater than the presently claimed viscosity of 0.003 Pa s to about 5 Pa s.

Claim 1 of the present invention relates to a dispersion defined above that comprises greater than about 35 wt % of metal base, and wherein the dispersion as measured by TA Instruments AR 500™ Rheometer using "cone on plate geometry" measured at about 40°C at 100 s<sup>-1</sup> ranges from about 0.003 Pa s to about 5 Pa s. The presently claimed viscosity range in combination with the weight percentage of metal base results in a high solids content low viscosity composition. In the presently claimed invention, the composition is a dispersion. The composition of claim 1 does not have the viscosity to be considered a gel or solid.

If a person of ordinary skill were to combine Forsberg Crawford, Rothon and Young, whilst the combination may result in a dispersion that includes features referred to by the Examiner as being disclosed in the secondary references i.e.,

- (a) the organic medium containing less than about 2 wt % of water; and
  - (b) the dispersion having a solid content from about 15 wt % to about 84 wt %;
- that has also been subject to grinding,

the resultant composition would, as shown by the Declaration under Rule 132 by Claire Hollingshurst where she attempted two different methods to reduce particle size of the Forsberg composition, still be a gel or solid or contain oversized particles. In contrast, the presently claimed invention milled in the substantial absence of water is not a gel or a solid as initially made because the viscosity as measured by TA Instruments AR 500™ Rheometer using "cone on plate geometry" measured at about 40°C at 100 s<sup>-1</sup> ranges from about 0.003 Pa s to about 5 Pa s. Thus, combination of references suggested by the Examiner results in a composition that is distinct from the claimed invention in that once you form the gel of Forsberg it is not reasonably viable to get to Applicant's lower viscosity fine particle dispersion even by water removal and further milling.

For that reason, it is submitted that the claimed invention is unobvious over Forsberg in view of Crawford, Rothon and Young. With regard to new dependent claim 19, the same remarks apply as noted above for claim 1, except the subject matter of the claim is further distinguished because the claimed composition is substantially free of an oil insoluble solvent. Forsberg explicitly requires the presence of water (see claim 1 of Forsberg). In contrast, the subject matter of claim 19 is substantially free of oil soluble solvent, and this could include water in the bulk of the composition. However, a person of ordinary skill knows that oil insoluble solvent does not include water of hydration that may be associated with the claimed metal bases. This is known from publications such as "The Penguin dictionary of Chemistry", Second Edition (enclosed). Page 206 defines hydrates are noted as many compounds that have crystallized water additional to that required for a simple stiocheiometry. Water can be bonded to cations by co-ordinate bonds from the oxygen or to anions by hydrogen bonding. In non-ionic derivatives, dipole interactions are also important. The gross structure of many materials is determined by the bonding of the water of hydration. As a consequence, any water bound to the metal base in the form of hydrated water is not considered to be insoluble solvent.

Independent claim 6 relates to a process to prepare the dispersion of claim 1 of the present invention. Since claim 1 is unobvious over the prior art cited by the Examiner, claim 6 is unobvious too for the same reasons stated above.

Independent claims 11 and 17 relate to specific applications for the dispersion of claim 1. Since the dispersion of claim 1 is unobvious over the prior art cited by the Examiner, these claims are unobvious too for the same reasons. In addition, it is noted that none of the references cited by the Examiner relate to the technical field of grease compositions that contain a hydroxy substituted alkanolic acid.

The Examiner is requested to withdraw the 35 U.S.C. §103(a) rejection over Forsberg in view of Rothon, Crawford and Young; and find all claims allowable.

#### Conclusion

For the foregoing reasons, it is submitted that the present claims are in condition for allowance. The foregoing remarks are believed to be a full and complete response to the outstanding Office Action. Therefore, an early and favorable reconsideration is respectfully requested. If the Examiner believes that only minor issues remain to be resolved, a telephone call to the undersigned is suggested.

Docket No. 3345-01  
Serial No. 10/598,577  
July 30, 2010  
Page 12

The Commissioner is authorized to charge the required fees for filing this response in time to meet the 4-month deadline of the Office Action from The Lubrizol Corporation Deposit Account No. 12-2275.

Enclosures: Petition for one month time extension  
Telephone Interview Summary  
Concise Science Dictionary, Third Edition, page 155  
The Penguin Dictionary of Chemistry, Second Edition, pg. 206

Respectfully submitted,

/Samuel B. Laferty/

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# Concise **Science** Dictionary

THIRD EDITION

Oxford New York  
**OXFORD UNIVERSITY PRESS**

potentials. Thus, they are much more difficult to oxidize and are more resistant to corrosion. In addition, the fact that they have  $d$ -electrons makes them show variable valency ( $\text{Cu}^1$ ,  $\text{Cu}^{2+}$  and  $\text{Cu}^{2+}$ ,  $\text{Ag}^1$  and  $\text{Ag}^{2+}$ ,  $\text{Au}^1$  and  $\text{Au}^{3+}$ ) and form a wide range of coordination compounds. They are generally classified with the "transition elements".

**coincidence circuit** An electronic logic device that gives an output only if two input signals are fed to it simultaneously or within a specified time of each other. A coincidence counter is an electronic counter incorporating such a device.

**coitus** See sexual intercourse.

**coke** A form of carbon made by the destructive distillation of coal. Coke is used for blast-furnaces and other metallurgical and chemical processes requiring a source of carbon. Lower-grade coles, made by heating the coal to a lower temperature, are used as smokeless fuels for domestic heating.

**colchicine** An alkaloid derived from the autumn crocus, *Colchicum autumnale*. It inhibits "spindle formation" in cells during mitosis so that chromosomes cannot separate during anaphase, thus inducing multiple sets of chromosomes (see polyploid). Colchicine is used in genetics, cytology, and plant breeding research and also in cancer therapy to inhibit cell division.

**cold-blooded animal** See ectotherm.

**cold emission** The emission of electrons by a solid without the use of high temperature (thermal emission), either as a result of field emission (see field-emission microscope) or "secondary emission".

**cold fusion** See nuclear fusion.

**Collembola** An order of insects comprising the beetles and weevils and consisting about 130,000 known species - the largest order in the animal kingdom. The forewings are hardened and thickened to form elytra, which meet at a precise mid-dorsal line and protect the underlying pair of hindwings and abdomen. The mouthparts are generally modified for biting and in some species assume antler-like proportions. Beetles

occur in a wide variety of terrestrial and aquatic habitats; many feed on decaying organic matter, some eat living vegetation, while others prey on other arthropods. A number of beetles and weevils are economically important pests of stored grain, timber, and crops. The young emerge as larvae and generally undergo metamorphosis via a pupal stage to form the adult beetle.

**coleoptile** A protective sheath that covers the young shoot of the embryo in plants of the grass family. It bursts open when the first leaves develop.

**Coleridge** Investigating growth movements of the oat coleoptile led to the discovery of the plant growth substance indoleacetic acid (IAA).

**coleorrhiza** A protective sheath that covers the young root of the embryo in plants of the grass family.

**collagen** An insoluble fibrous protein found extensively in the connective tissue of skin, tendons, and bone. The polypeptide chains of collagen (containing the amino acids glycine and proline predominantly) form triple-stranded helical coils that are bound together to form fibrils, which have great strength and limited elasticity. Collagen accounts for over 30% of the total body protein of mammals.

**collecting duct** Any of the ducts in the mammalian "kidney" that drains into the renal pelvis, which leads to the ureter. They are the main sites of water reabsorption from the glomerular filtrate, which drains into the ducts from the "distal convoluted tubules" of the "nephrons". The cells of the collecting ducts are relatively impermeable to water. However, the influence of "antidiuretic hormone" increases the permeability of the collecting ducts, allowing the reabsorption of water and controlling the final urine concentration according to the body's state of hydration.

**collective excitation** A quantized mode in a many-body system, occurring because of cooperative motion of the whole system as a result of interactions between particles. "Phonons" and "plasmaons" in solids are examples of

collective excitations. Collective excitations obey Bose-Einstein statistics (see quantum statistics).

**collector** See transistor.

**collembola** See ground tissues.

**colloidal properties** Properties that depend on the concentration of particles (molecules, ions, etc.) present in a solution, and not on the nature of the particles. Examples of colloidal properties are osmotic pressure (see osmosis), "lowering of vapour pressure," "depression of freezing point," and "elevation of boiling point."

**collimator** 1. Any device for producing a parallel beam of radiation. A common arrangement used for light consists of a convex achromatic lens fitted to one end of a tube with an adjustable slit at the other end, the slit being at the principal focus of the lens. Light rays entering the slit leave the lens as a parallel beam. Collimators for particle beams and other types of electromagnetic radiation utilize a system of slits or apertures. 2. A small fixed telescope attached to a large astronomical telescope to assist in lining up the large one onto the desired celestial body.

**collision density** The number of collisions that occur in unit volume in unit time when a given neutron flux passes through matter.

**colloid** A thin film of cellulose nitrate made by dissolving the cellulose nitrate in ethanol or ethoxyethane, treating the surface, and evaporating the solvent.

**colloids** Colloids were originally defined by Thomas Graham in 1861 as substances, such as starch or gelatin, which will not diffuse through a membrane. He distinguished them from crystalloids (e.g., inorganic salts) which would pass through membranes. Later it was recognized that colloids were distinguished from true solutions by the presence of particles that were too small to be observed with a normal microscope yet were much larger than normal molecules. Colloids are now regarded as systems in which there are two or more phases, with one (the dispersed phase)

distributed in the other (the continuous phase). Moreover, at least one of the phases has small dimensions (in the range  $10^{-9}$ – $10^{-6}$  m). Colloids are classified in various ways.

Sols are dispersions of small solid particles in a liquid. The particles may be macromolecules or may be clusters of small molecules. Lyophobic sols are those in which there is no affinity between the dispersed phase and the liquid. An example is silver chloride dispersed in water. In such colloids the solid particles have a surface charge, which tends to stop them coming together. Lyophobic sols are inherently unstable and in time the particles aggregate and form a precipitate. Lyophilic sols, on the other hand, are more like true solutions in which the solute molecules are large and have an affinity for the solvent. Starch in water is an example of such a system. Association colloids are systems in which the dispersed phase consists of clusters of molecules that have lyophobic and lyophilic parts. Soap in water is an association colloid (see micelle).

Emulsions are colloidal systems in which the dispersed and continuous phases are both liquids, e.g. oil-in-water or water-in-oil. Such systems require an emulsifying agent to stabilize the dispersed particles.

Gels are colloids in which both dispersed and continuous phases have a three-dimensional network throughout the material, so that it forms a jelly-like mass. Gelatin is a common example. One component may sometimes be removed (e.g. by heating) to leave a rigid gel (e.g. silica gel).

Other types of colloid include "aerosols" (dispersions of liquid or solid particles in a gas, as in a mist or smoke) and foams (dispersions of gases in liquids or solids).

**cologarithm** The logarithm of the reciprocal of a number.

**colon** The section of the vertebrate "large intestine" that lies between the "caecum" and the "rectum". Its prime function is to absorb water and minerals from indigestible food residues passing from the small intestine, which results in the formation of "faeces".

THE PENGUIN DICTIONARY OF  
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*Edited by* D. W. A. SHARP, M.A., PH.D.,  
C.CHEM., F.R.S.C., F.R.S.E.

*Second Edition*



PENGUIN BOOKS

The *absolute humidity* is the mass of water vapour per unit mass of dry air.

The *percentage humidity* is the ratio of the amount of water vapour present per unit mass of dry air to the amount the air could hold if saturated at the same temperature, expressed as a percentage.

The *relative humidity* is the ratio of the partial pressure\* of the water vapour in the air to the partial pressure of water vapour in the air when saturated at the same temperature. This ratio is usually expressed as a percentage.

The humidities for systems other than air and water are defined in an analogous manner.

**humus** The characteristic organic constituent of the soil. It is a dark-coloured amorphous material and is formed by the microbiological decomposition of plant materials, chiefly lignin and proteins. It occurs in the soil in company with clay, forming a colloidal clay-humus complex.

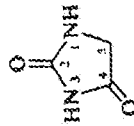
**Hund's rules** Rules which describe the electronic configuration of degenerate orbitals in the ground state. The electronic configuration will have the maximum number of unpaired electrons, i.e.  $\uparrow \uparrow \uparrow$  rather than  $\uparrow \uparrow \uparrow \uparrow$ . The ground state will have the maximum orbital angular momentum.

**hyaluronate** A collective name for mucopolysaccharides from the vitreous humor of the eye, the umbilical cord and synovial fluid. It is composed of units of D-glucuronic acid and N-acetyl-D-glucosamine.

**hyaluronidase** A glycolytic enzyme which hydrolyses hyaluronic acid and chondroitin. It acts by hydrolysing the link between glucuronic acid and the glucosamine moiety (or galactosamine in chondroitins).

**hybridization** The process whereby atomic orbitals of differing type but similar energies are combined to yield a set of equivalent hybrid orbitals. These hybrid orbitals do not in fact exist and the process of hybridization is simply a mathematical operation in the formation of the molecular orbitals by combining the atomic orbitals of the constituent atoms of a molecule. E.g. in methane, which contains four equivalent C-H bonds, it may be considered that the C-atom 2s and 2p orbitals are hybridized to give four equivalent  $sp^3$  orbitals which are then each combined with an H-atom 1s orbital.

**hydantoins, glyoxylylureas**,  $C_3H_3N_3O_2$ . Colourless needles; m.p. 220°C. Soluble in alcohol,



sparingly soluble in water. Prepared by the condensation of glycine with potassium cyanate and boiling the hydantoic acid so formed with hydrochloric acid. It is present in beet molasses. Many substituted hydantoins have been prepared.

**hydrocarpic acid**,  $C_{10}H_{18}O_2$ . M.p. 59-60°C.



A fatty acid occurring as glycerides in chauf-moogra oil and other vegetable oils.

**hydroxylic acid** See 2-hydroxy-propionic acid.

**hydrates** Many compounds have crystallized water additional to that required for a simple stoichiometry. Water can be bonded to cations by co-ordinate bonds from the oxygen or to anions by hydrogen bonding. In non-ionic derivatives dipole interactions are also important. The gross structure of many materials is determined by the bonding of the water of hydration.

**hydration** Ions (and many other species) in aqueous solutions are solvated by water and are said to be hydrated. The proton in aqueous solution is generally written as  $[H_3O]^+$  and three or four other water molecules are associated with the proton. Hydration occurs either by interaction of the lone-pairs of electrons in water with a cation or by hydrogen bonding with anions. Secondary hydration spheres also exist.

**hydraulic cement** See cement.

**hydraulic conveying** The conveying of particulate solids (e.g. coal, china clay, wood pulp) as a slurry through a pipeline.

**hydraulic fluids** Fluids used to transmit power and pressure. Most hydraulic fluids are based on low-viscosity mineral oils but for reasons of economy or safety aqueous-base fluids are also used.

**hydrazides**,  $MNHNH_2$ . The sodium and other alkali metal derivatives are formed from M,  $MNH_2$ , or MH and hydrazine,  $NaNHNH_2$ , explosives with oxygen or above 100°C. It

cleaves a C=C bond and, e.g.,  $PhCH=CHMe$  gives  $PhMe$  and  $MeCH=NNH_2$  (a hydrazine zone). More generally derivatives of hydrazine.

**hydrazine**,  $N_2H_4$ . M.p. 1.4°C. b.p. 114°C. Has structure  $H_2N-NH_2$  in the gauche form. Manufactured from  $NH_3$  or urea and  $NaOCl$  or  $Cl_2$  in the presence of a ketone and gelatin (Raschig process). Forms an azeotrope with water, anhydrous  $N_2H_4$  is obtained by distillation over  $NaOH$  or precipitation of the sulphate which reacts with liquid  $NH_3$  to give  $(NH_4)_2SO_4$  and  $N_2H_4$ . Hydrazine is a weak base giving hydrazinium salts, e.g.  $(N_2H_5)Cl$  with strong acids. Aqueous solutions can be oxidizing giving  $(NH_4)^+$  in acid with  $Ti^{3+}/E^0 + 1.27$  volt) in slow reactions but are more generally reducing giving  $N_2/E^0$  acid + 0.23 volt;  $E^0$  alkaline + 1.15 volt). Forms complexes but generally acts only as a monodentate ligand. Burns in oxygen, reacts with halogens. Used for removing  $O_2$  from boiler-feeding water, etc. and in the manufacture of hydrazides. Organic derivatives have many uses including use as high-energy fuels, blowing agents for foam plastics, antioxidants, herbicides.

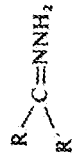
**hydrazinium salts** See hydrazine.

**hydrazobenzene**, 1,2-diphenylhydrazine,  $C_{12}H_{12}N_2$ ,  $PhNH-NHPh$ . Colourless plates; m.p. 131°C. Insoluble in water, easily soluble in organic solvents. In moist air or in alcoholic solution it oxidizes spontaneously to azobenzene. It does not form salts with acids but is converted into benzidine by an intramolecular change. It gives two molecules of aniline when treated with a strong reducing agent.

It is prepared by reduction of nitrobenzene with iron and  $NaOH$ . It is also prepared by an electrolytic reduction of nitrobenzene. It is widely used for the preparation of benzidine.

**hydrazoic acid, azotimide**,  $N_3H$ ,  $NNNH$ . M.p. -80°C. b.p. 37°C. Prepared from sodium azide and acid or  $(N_3H_1)^+$  plus nitrous acid,  $HNO_2$ . Heavy-metal salts, azides, are used as detonators, alkali metal salts are stable and azides are used synthetically in organic chemistry.

**hydrazones** The derivatives formed by con-



densation between an aldehyde or ketone and hydrazine. Substituted hydrazines, especially

2,4-dinitrophenylhydrazine, are used for preparing crystalline derivatives for chemical identification of keto-compounds.

**hydrides** There are several distinct types of hydrides.

(1) *Salt-like*. These are the hydrides of the most electropositive elements (e.g. Na) and contain ions.

(2) *Covalent*. Formed by most of the non-metals and transition metals. This class includes such diverse compounds as methane,  $CH_4$ , and iron carbonyl hydride,  $H_2Fe(CO)_4$ . In many compounds the hydrogen atoms act as bridges. Where there are more than one hydride sites there is often hydrogen exchange between the sites. Hydrogens may be inside metal clusters.

(3) *Complexes*. These derivatives contain complex anions which may be considered as derived from co-ordination of an  $H^-$  ion to a metal or non-metal. Examples are the  $BH_4^-$  and  $ReH_9^{3-}$  ions.

(4) *Transition metal hydrides*. These are formed by hydrogen uptake by the metal. The phases are often non-stoichiometric.

Hydrides frequently function as hydrogenation catalysts.

**hydroiodic acid, HI**. An aqueous solution of hydrogen iodide\*.

**hydroboration** The *cis*- addition of B-H bonds across the double bonds of olefins. Thus diborane,  $B_2H_6$ , reacts with ethene to give  $BC_2H_5_2$ . Breakdown of the alkyl borane with acid gives alkanes and with hydrogen peroxide gives alcohols (the orientation is the opposite to that which would result from the direct addition of water across the double bond). See organoboranes.

**hydrobromic acid, HBr**. An aqueous solution of hydrogen bromide\*.

**hydrocarbon resins** Thermoplastic polymers of mol. wt. less than 2000 obtained by cracking petroleum and from turpentine. Used in drying oils, with rubber and as plasticizers. Class includes coumarone-indene resins, petroleum resins, cyclopentadiene resins, terpene resins.

**hydrocarbons** This term includes all compounds of carbon and hydrogen only. They are subdivided into aliphatic and cyclic hydrocarbons according to the arrangement of the carbon atoms in the molecule. The aliphatic hydrocarbons are again subdivided into paraffins, olefins, diolefins, etc., according to the number of double bonds in the molecule. The cyclic hydrocarbons are subdivided into aromatic hydrocarbons and cycloparaffins.